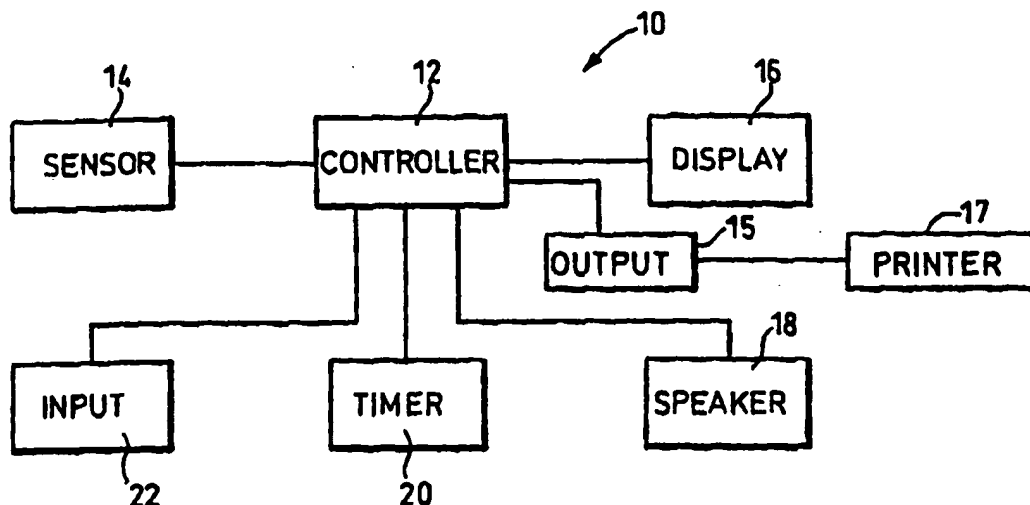




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB98/02539 (22) International Filing Date: 24 August 1998 (24.08.98)  (30) Priority Data: 9717943.6      26 August 1997 (26.08.97)      GB 9719243.9      11 September 1997 (11.09.97)      GB 9721560.2      13 October 1997 (13.10.97)      GB 9722187.3      22 October 1997 (22.10.97)      GB  (71)(72) Applicant and Inventor: BARRETT, Michael [GB/GB]; 79 Botha Road, Bordesley Green, Birmingham B9 5LT (GB).  (74) Agents: BARNFATHER, Karl, Jon et al.; Withers & Rogers, 4 Dyer's Buildings, Holborn, London EC1N 2QP (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published With international search report.	

(54) Title: BOXING MONITORING DEVICE



## (57) Abstract

A monitoring device for boxing comprising a sensor (14) for detecting impacts in terms of number and/or in terms of value, and preferably means such as a display (16) for presenting the user with information regarding the number of hits and/or force exerted by an impact.

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## BOXING MONITORING DEVICE

The invention relates to a device for monitoring the performance of a boxer and in particular to a device to be carried by for example the hand, or on a glove worn on the hand, or possibly to be carried by the target of the boxer for example a punch-bag or a helmet worn by sparring partner of the boxer.

It is common place in boxing for boxers to undergo extensive training. This training involves many hours spent practising on punch bags and ball bags (herein called punch-bags) as well as sparring. Such training can become monotonous and a boxer can lack motivation due to a lack of information regarding any improvements in performance.

The invention seeks to provide means for a boxer to monitor his or her performance. According to one aspect of the invention there is provided a monitoring device comprising a sensor for detecting impact at least in terms of number and possibly also in terms of value, as hereinafter explained.

Beneficially therefore the user can be presented with information regarding the number of hits he or she has made on a punch bag or using the glove and/or information about the force exerted by an impact.

In one possibility a sensor comprises a force transducer which relays a signal representative of the force of an impact to the controller. The force transducer can comprise an electronic

capacitance device or a strain gauge for example. The capacitance device can comprise a pair of electrically conductive plates resiliently biased away from one another. The plates can form part of an outer membrane of a cell which membrane comprises resilient material and wherein the cell is filled with a substantially incompressible fluid such as water. The resilience of the membrane allows the plates to move relative to one another thereby to vary the capacitance which can be detected electronically by the controller.

In a preferred form the monitoring device further comprises a timer operably in communication with the controller. The controller preferably counts the number of impacts on or by a glove in a predetermined time period and provides this information to the user via the output. The predetermined time period can for example be three minutes which is the length of a bout in a boxing match. The controller can then restart counting after a predetermined rest period. The rest period can be 30 seconds or one minute again emulating the rest period of a boxing match.

The output to the user can be a display such as a liquid crystal display which can display the number of impacts on the glove in the predetermined time period, or a total number of counts for example. Also, the output can comprise a speaker for providing an audible signal. An audible beep can for example signal expiry of the predetermined rest period indicating that the boxer should again commence boxing. The output could also be a plug or I/O port

enabling communication to a printer or computer for example.

In another form, the monitoring device comprises an input such as a button or key pad enabling a user, or a trainer for example, to input a signal to the controller. For example, the input could comprise a reset button thereby to recommence the predetermined time period for training or the rest period for example.

Another aspect of the invention provides a monitoring device which is retrofittable to a boxing glove. A further aspect of the invention provides a sensor for detecting an impact on a boxing glove. Further aspects include a boxing glove comprising a monitoring device and a punch bag comprising a monitoring device.

In a preferred form, the invention comprises the use of an accelerometer, that is a sensor or detector to measure the applied force in the impact of hand on target. The sensor may be carried on the hand, for example in a miniaturised device strapped to a finger and possibly connected to a read-out device on the wrist of the same hand.

The read-out may comprise a digital display and/or an output to a remote display device so that for example a trainer can observe a monitor to oversee performance from the ringside. The output could be via an infra-red signal beamed from the wrist carried read-out to the monitor.

Instead of mounting the sensor direct on the hand it could be on the glove, or it could be on the target.

The advantages of the accelerometer are that when arranged so as to be read on impact rather than by the mere movement of the glove, it will read only hits. Only a hit will produce such rapid deceleration of the hand as to cause a reading from the device. Moreover, the force of the impact can be measured: in the simplest version, only a deceleration beyond a threshold will read. Hence a feint where the boxing glove stops short of the target will not give a reading.

In constructional detail the accelerometer may comprise a mercury switch, or it may comprise an electronic device of the strain gauge type associated with a striker which is free to move in a casing of the device, or possibly a piezo-electric device.

Hence in the accelerometer versions of the invention the boxer will get an indication of score of the total number of hits which are of a force exceeding the preset and possibly variable minimum force, and possibly obtain this score for each discreet time period of training round.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

FIGURE 1 is a schematic front elevation view of a boxing glove according to the invention;

FIGURE 2 is a schematic rear elevated view of the boxing glove shown in Figure 1;

FIGURE 3 is a schematic block diagram of a monitoring device according to the invention;

FIGURES 4 and 5 are schematic perspective and side elevation views of a sensor according to the invention, and

FIGURE 6 is a schematic view of a punch bag according to the invention.

Referring to Figures 1 and 2 there is shown a boxing glove B comprising a mitt M, thumb T and elasticated wrist-band W. Boxing glove B comprises a monitoring device 10 shown schematically in Figure 3 comprising a controller 12, sensor 14, in mitt M, and a display 16 attached to the front or inside of wrist W. Adjacent display 16 there is an output socket 15 and input button 22.

Monitoring device 10 is shown in Figure 3 further comprises a speaker 18, timer 20 and input 22. These elements together with the display and sensor all operably communicate with controller 12 in use. The monitoring device 10 can for example be powered using a small DC battery. The device 10 preferably comprises an output 15 such as a socket or I/O port enabling, possibly real-time, communication with a peripheral device.

The peripheral device can be a printer 17 which can print out

results from device 10. Alternatively the peripheral device can be a computer such as a PC which can in turn produce a hard copy of the results via a printer.

Referring to Figures 4 and 5 there is shown a preferred form of a sensor 14a comprising a membrane 30 which can have an oval or elliptical shape in plan view and which membrane defines a cell comprising an incompressible fluid such as water for example. The upper and lower surface of membrane 30 carry a pair of electrically conductive plates 32 and 34, one of which at least is electrically connected to controller 12 for example using wire which can be threaded through glove B to the wrist-band area. The plates can be formed or a thin layer of metal for example in order to be flexible. Alternatively the plates may comprise an electrically conductive strip on a flexible sheet such as a plastic or rubber sheet.

In use a boxer can commence training by pressing a button which forms part of input 22 thereby to reset controller 12 which commences monitoring sensor 14. Each time a boxer hits a punch bag for example this is detected by sensor 14. With sensor 14a this is detected by decrease in the separation of plates 32 and 34 thereby to change the capacitance between the plate which can be detected electronically by controller 12. The impact is recorded in the memory of controller 12 and can simultaneously be shown visually to the user at display 16 by providing a number representative of the number of impacts detected by sensor 14.



The controller can monitor sensor 14 for a predetermined time period. Accordingly, when controller 10, in communication with timer 20, detects that the time period has elapsed, the number of counted impacts can be shown to the user on display 16 and also speaker 18 can emit a noise indicating that the training period is completed. Controller 12 can be programmed to allow a predetermined rest period before the user recommences training. A second, possibly different audible noise can be emitted from speaker 18 to tell the user to commence boxing. Again the number of counted punches can be displayed at display 16.

Further, controller 12 can be configured to continue for a predetermined number of training periods such as 5 or 10 for example. A total number of counts over all of the time periods can be displayed at 16 as well as the count for each bout or training period, and an average over all the bouts.

Input 22 can be used to select the length of time of the predetermined training period, the predetermined resting period, and the number of bouts as well as the start of the training sessions.

Preferably sensor 14 acts as a force transducer capable of detecting the magnitude of force for a given impact with a boxing glove. For example, the variation in capacitance of sensor 14a can be calibrated to provide a reading of the force at display 16. Alternatively, an average force can be displayed at display 16 after a

bout.

The variation could be used simply to provide a number of read-outs representative of the force of input which number could be on a scale from 0 to 100 say. Although it could read in weight and speed of impacts.

Accordingly, controller 12 comprises an analogue to digital convertor in an embodiment comprising the analogue sensor 14a. Controller 12 can comprise a microprocessor which analyses the digital output of the ADC and stores this information for each punch or impact ready to be averaged after a predetermined time period.

Accordingly, the invention provides a range of information to a user which can be used to monitor the performance of a boxer and therefore detect improvements in fitness and ability. For example, a boxer can detect an increase in the number of punches delivered in a given time period and/or an increase in the average force applied by each impact during a training period.

The device is preferably programmable to allow a user to select the number of rounds, length of round and length of rest period for a given training session.

Also output 15 enables communication to a peripheral device.

Referring to Figure 6 there is shown a punch bag P according

to the invention. Punch bag P comprises an inner bag 40 filled with known material such as fabrics and/or sand. Additionally, punch bag P comprises an outer membrane 42 which is struck during practice. Membrane 42, together with a top membrane 44, which can be made of a strong plastics material for example, define a cell or chamber 46. The punch bag P further comprises a pressure or force transducer 14b which can be located on top membrane 44. The punch bag P is hung on hooks H using chains C which enable the punch bag to be attached to a wall or ceiling of a gym for example. The punch bag further comprises a display 16 and other components of a monitoring device 10. Preferably an output 15 from device 10 enables communication via a cable 48 to a peripheral device 17 such as a printer or computer

In use, a boxer punches bag P which creates an increase in the pressure of the fluid within cell 46 due to displacement of membrane 42. This increase in fluid pressure can be detected by transducer 14b which operably communicates with controller 12 as previously described. Accordingly, punch bag P can monitor the performance of a boxer. For example, transducer 14b can comprise a moveable thin membrane of elastic material which moves a strain gauge or spring in order to determine the power in a punch against the punch bag P which is dependent on the level of displacement of the elastic membrane. Alternatively, inner bag 40 can have a plate 34 and outer membrane 42 can have a plate 32 similar to that described in relation to sensor 14a shown in Figures 4 and 5.

Accordingly, a boxer can monitor his or her performance by watching display 16 and listening for an audible output from a speaker 18, or reading a print-out from printer 17. This enables the boxer to have a record of a training session for future reference.

## CLAIMS

1. A monitoring device for boxing comprising a sensor for detecting impact in terms of number and/or in terms of value.
2. A monitoring device according to Claim 1 comprising means for presenting the user with information regarding the number of hits he or she has made on a punch bag or using a glove and/or information about the force exerted by an impact.
3. A monitoring device according to Claim 1 or 2 wherein the sensor comprises a force transducer which relays a signal representative of the force of an impact to a controller.
4. A monitoring device according to Claim 3 wherein the force transducer comprises an electronic capacitance device or a strain gauge.
5. A monitoring device according to Claim 4 wherein the capacitance device comprises a pair of electrically conductive plates resiliently biased away from one another.
6. A monitoring device according to Claim 5 wherein the plates form part of a membrane of a cell which membrane comprises resilient material and wherein the cell is preferably filled with a substantially incompressible fluid such as water.

7. A monitoring device according to any preceding claim further comprising a timer operably in communication with a controller.
8. A monitoring device according to Claim 7 wherein the controller counts the number of impacts on or by a glove in a predetermined time period and provides this information to the user via an output means.
9. A monitoring device according to Claim 8 wherein the predetermined time period is about three minutes.
10. A monitoring device according to Claims 8 or 9 wherein the controller restarts counting after a predetermined rest period.
11. A monitoring device according to Claim 10 wherein the rest period is about 30 seconds to about one minute.
12. A monitoring device according to any preceding claim comprising output means having a display such as a liquid crystal display which operably displays the number of impacts on the glove in a predetermined time period, and/or a total number of counts.
13. A monitoring device according to any preceding claim comprising output means having a speaker for providing an audible signal.

14. A monitoring device according to Claim 13 wherein the output means emits an audible beep to indicate the beginning of a predetermined exercise period and/or a predetermined rest period.

15. A monitoring device according to Claim 13 or 14 wherein the output means comprises a plug, I/O port, and/or infrared device enabling communication to a printer or computer for example.

16. A monitoring device according to any preceding claim comprising an input means such as a button or key pad enabling a user or a trainer to input a signal to a controller.

17. A monitoring device according to Claim 16 wherein the input means operably generates a signal to the controller to recommence a predetermined time period for training or rest.

18. A monitoring device according to Claim 16 or 17, wherein the input means enables the user to select the duration of a training period and/or a rest period.

19. A monitoring device which is retrofittable to a boxing glove preferably comprising any of the features in Claim 1 to 18.

20. A monitoring device according to any of Claims 1 to 19 wherein the sensor comprises an accelerometer which operably measures the applied force in the impact of hand on target.

21. A monitoring device according to Claim 20 wherein the accelerometer comprises a mercury switch.
22. A monitoring device according to Claim 20 wherein the accelerometer comprises an electronic device of the strain gauge type associated with a striker which is free to move in a casing of the device, or possibly a piezo-electric device.
23. A monitoring device according to any preceding claim comprising means for determining if a hit is above a minimum force.
24. A monitoring device according to Claim 23 comprising means to enable a user to set the value of the minimum force.
25. A monitoring device according to any preceding claim wherein a sensor is adopted to be carried on the hand.
26. A monitoring device according to any preceding claim wherein the sensor is a miniaturised device adopted to strap to a finger.
27. A monitoring device according to any preceding claim comprising output means having a read-out device adopted to attach to the wrist of the user.
28. A sensor for detecting an impact on a boxing glove or punch bag comprising any of the features of Claims 3 to 6 or 20 to 26.



29. A boxing glove comprising a monitoring device according to any of Claims 1 to 27.

30. A punch bag comprising a monitoring device according to any of Claims 1 to 27.

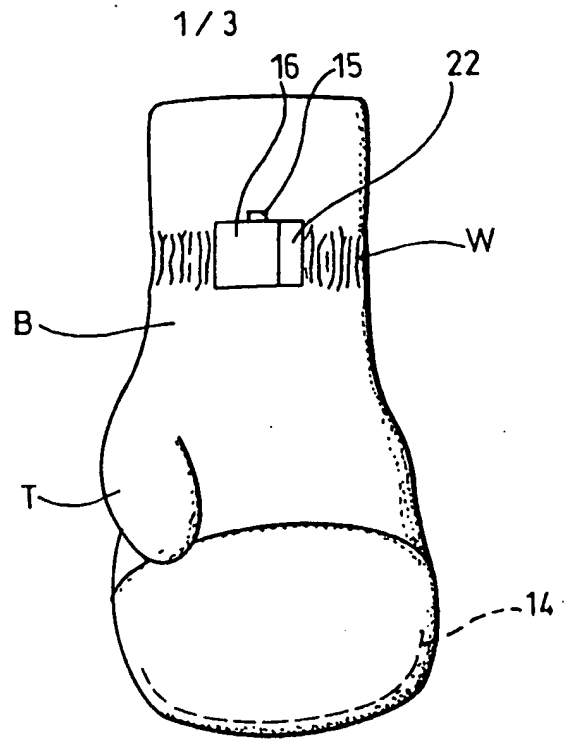


FIG. 1.

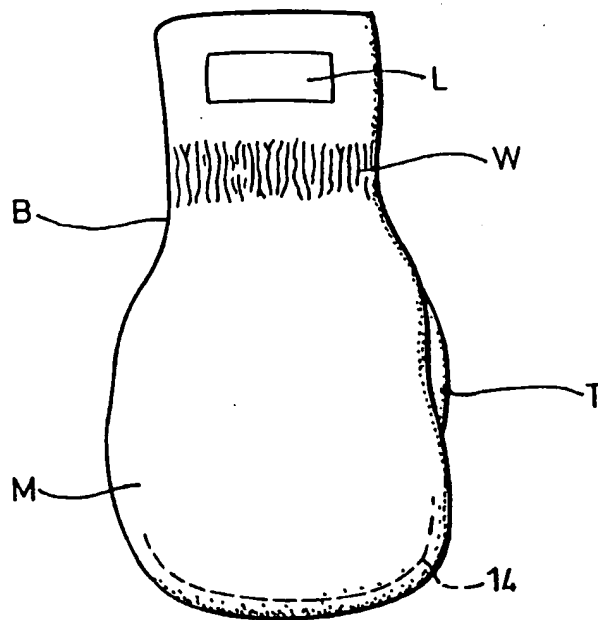


FIG. 2.

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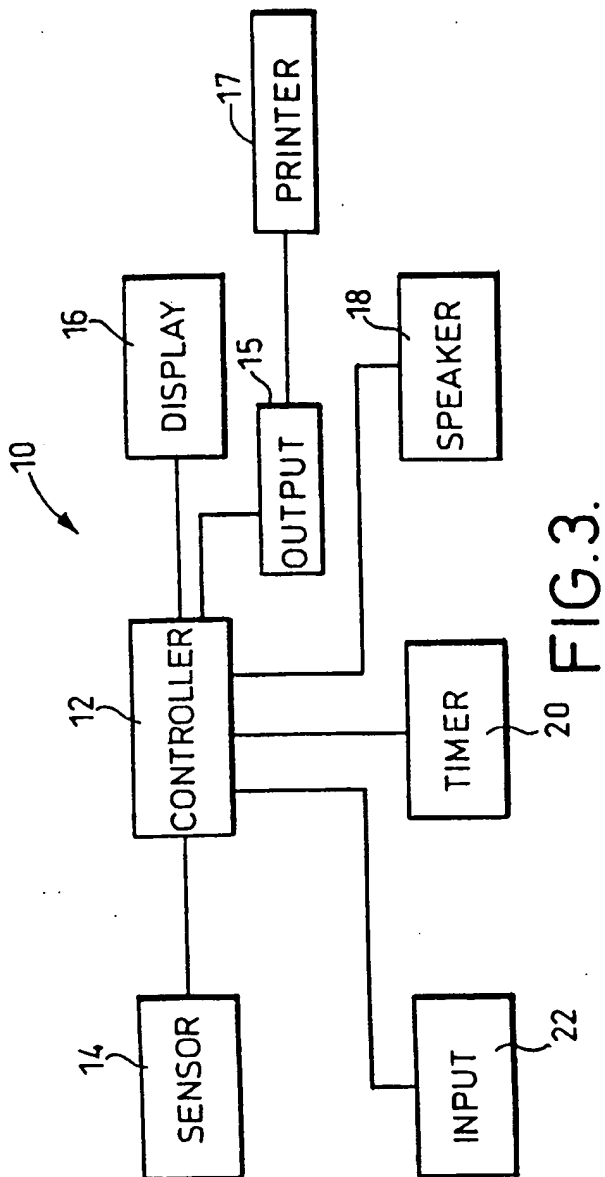


FIG. 3.

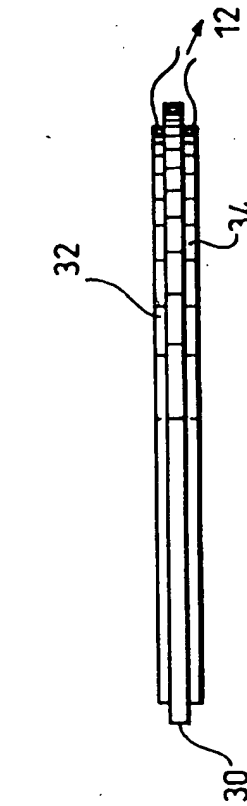


FIG. 4.

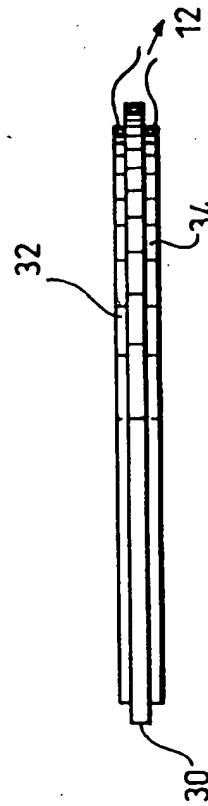


FIG. 5.

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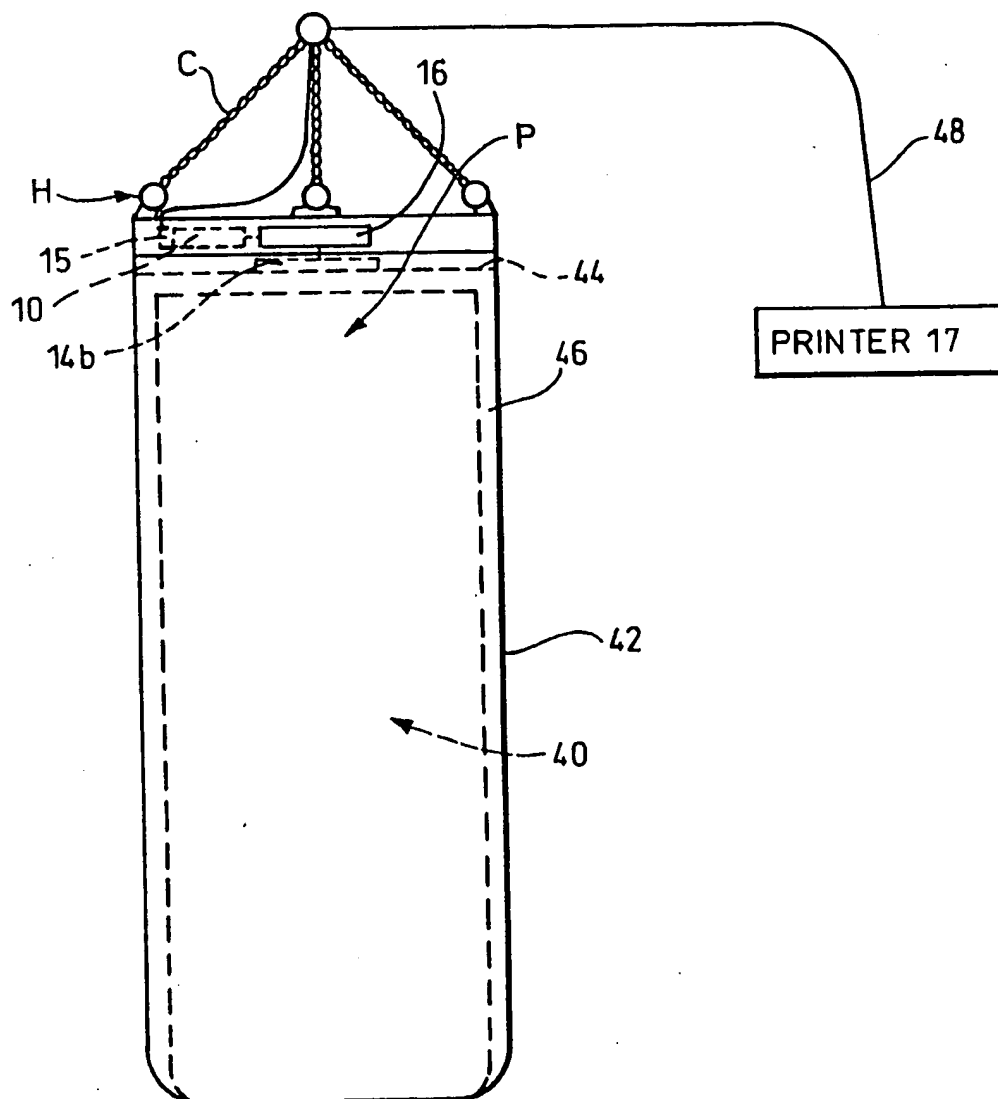


FIG. 6.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/02539

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A63B69/32 A63B69/20

According to International Patent Classification(IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 605 336 A (GAOIRAN MAYROSE A ET AL) 25 February 1997  see column 3, line 60 - line 65 see column 5, line 57 - column 6, line 2 see column 7, line 30 - line 37 see column 7, line 56 - line 65 see column 9, line 3 - line 13 see column 11, line 27 - line 39 see column 11, line 61 - line 67 see column 13, line 48 - line 63 see column 15, line 47 - line 50 see column 16, line 20 - line 32 see column 16, line 46 - line 52 see abstract; figures 1-3,13,18,19	1-4,7, 12-18, 20-24
Y	--- -/--	5,6,8

☒ Further documents are listed in the continuation of box C.

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X	US 4 883 271 A (FRENCH) 28 November 1989  see column 5, line 12 - line 62 see column 7, line 29 - column 8, line 42 see figures 3,6,10	1-4,7,8, 23-25, 27-30
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X	US 4 941 660 A (WINN ET AL.) 17 July 1990 see abstract; claim 1; figures	1-3,8,30
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A	US 5 280 905 A (MICCO) 25 January 1994 see column 4, line 26 - column 5, line 10; figure 11	4,5,21
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